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(54) **Fuse alarm system**

(57) In a system for detecting failure of any one of a number of fuses F1—Fn wherein each fuse has an auxiliary contact which releases when the fuse fails to establish a connection to a common bus AB, the monitoring circuit connected to the bus is designed to be fail-safe. So long as there is no fault a steady current flows via an arbitrary one Fn of the fuses through a diode Dn, detector OI and resistor RA. Failure of any fuse, however, short circuits the detector so that it no longer conducts current. The detector includes an optical isolator.

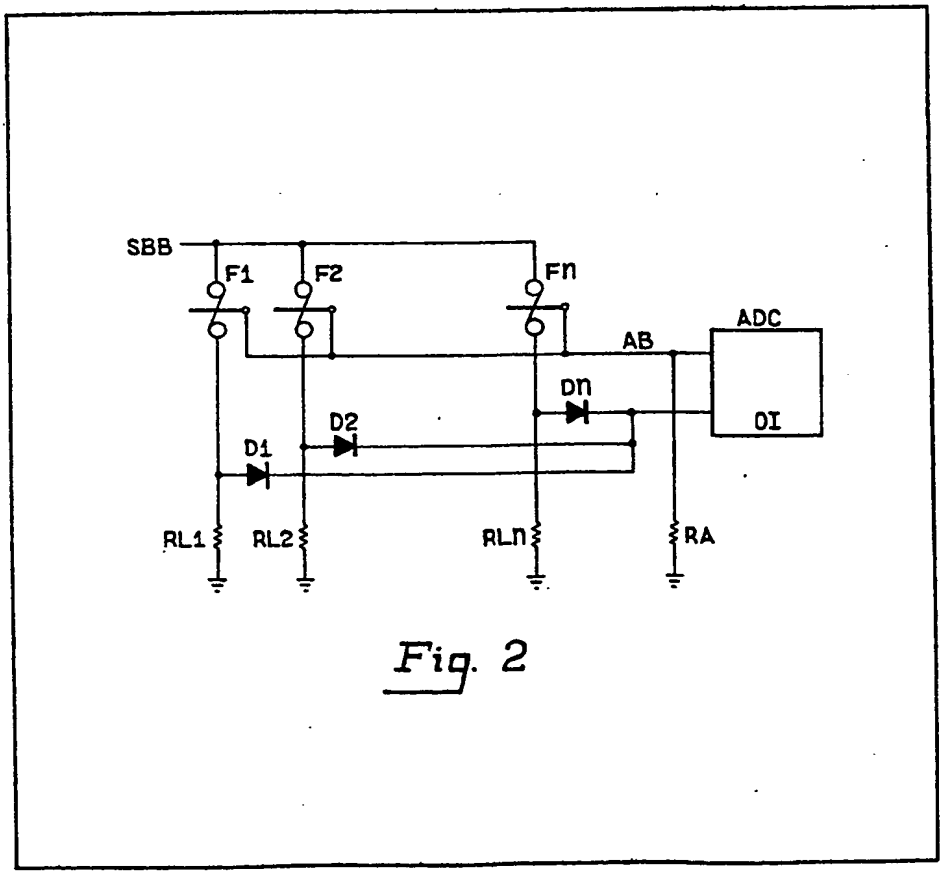

Fig. 2

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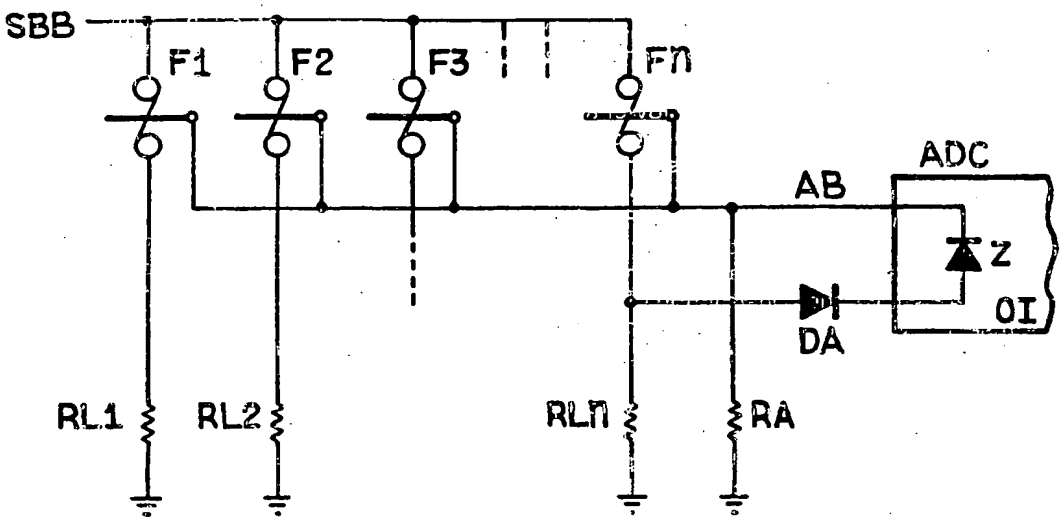

Fig. 1

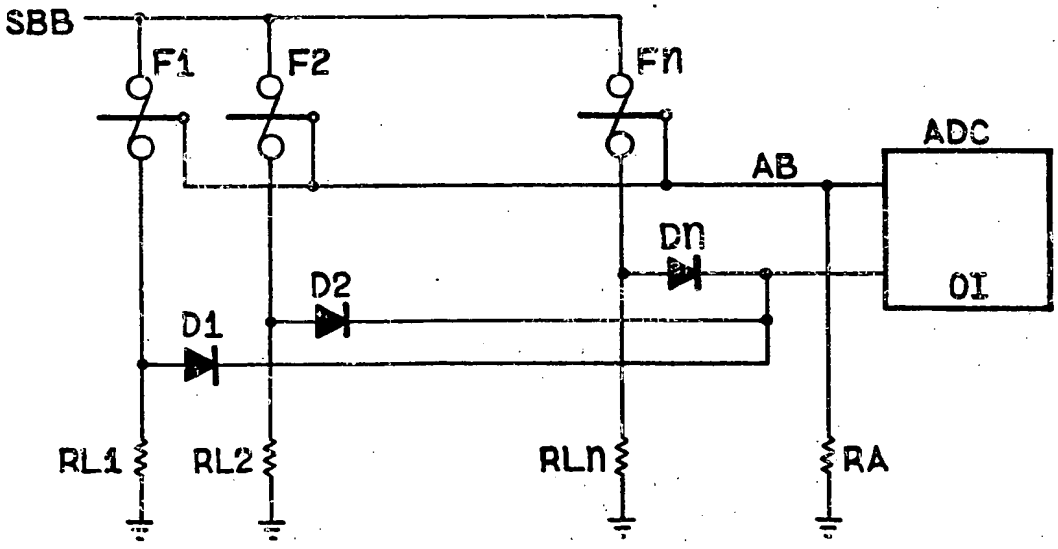

Fig. 2

SPECIFICATION

Improved fus alarm system

The present invention relates to fuse alarm systems particularly, although not exclusively, for use in telecommunication exchange systems.

The fuses used in telecommunications exchange systems are of the so-called alarm type in which the fuse wire is held in tension between two spring tongues. The tongues are so arranged that, when the fuse wire melts, the lower alarm tongue acts as an alarm contact spring and makes contact with an alarm bar in the fuse mounting whilst the upper tongue stands out prominently from the fuse mounting. Reference to Fig. 614 on page 433 of Volume one of Telephony by J. Atkinson published by Sir Isaac Pitman & Sons Ltd. in 1948 shows the construction of an alarm type fuse. Individual fuses are placed in a fuse mounting arrangement in such a way that, when a fuse blows, the main supply bus-bar is connected to the alarm bar of the arrangement. Typically the alarm bars are connected to a common alarm bus which is connected to a red alarm lamp which is common to an equipment rack. The other side of the lamp is connected to earth via a fuse alarm relay which is common to one sub-section of the exchange. If any fuse on the rack blows, the alarm tongue of the blown fuse connects the main battery bus-bar to the common alarm bus and thereby completes a circuit to light the rack alarm lamp and operate the sub-section fuse alarm relay.

Such an arrangement suffers from certain disadvantages in that a normally idle alarm bus-bar is extended to a centralised alarm point and activation of the alarm occurs only when the supply voltage is connected to it by a blown fuse. Consequently failure in the alarm extension wiring or in the main supply voltage to the fuse assembly will not provide any alarm conditions.

It is an aim of the present invention to provide a fail safe fuse alarm system for use with alarm type fuses.

According to the invention there is provided a fuse alarm system comprising a plurality of alarm type fuses having their alarm bars connected to a common alarm bus which feeds an alarm detection circuit, the common alarm bus being driven under non-alarm conditions by an idle state current which is interrupted by the activation of a fuse and the alarm detection circuit is arranged to detect the absence of the idle state current to activate an alarm condition.

According to one embodiment of the invention there is provided a fuse alarm system comprising a plurality of alarm type fuses having their alarm bars connected to a common alarm bus the common alarm bus being connected to one input of a two input unidirectional alarm det ction circuit and to an idle state current d fining resistor whereas the oth r input of the alarm detection circuit is connected to one of the fuse outlets, the unidirectional alarm detection circuit being connected in such polarity manner that an idle state current flows through the alarm device when all fuses are intact and is interrupted when any fuse blows.

Preferably the alarm detection circuit is an optical isolator providing additional isolation and protection for the alarm system with the light emitting diode sensing the idle state current.

In a feature of the invention the other input of the alarm detection circuit is connected to a plurality of the fuse outlets and each such connection includes a diode so that an "OR" gate arrangement is forced to provide the source of idle state current for the alarm detection circuit.

The invention together with its various features will be more readily understood from the following description which should be ready in conjunction with the accompanying drawing comprising Figs. 1 and 2. Fig. 1 shows a basic arrangement according to the invention whereas Fig. 2 shows an alternative embodiment of the invention.

Considering firstly Fig. 1, the fuse alarm system comprises a bank of alarm type fuses F1 to FN the outlets of which each serve a discrete system load, depicted in Fig. 1 as a resistance values RL1 to RLN. The fuses are fed from the main exchange supply bus-bar shown as SBB. The alarm bars of all the fuses F1 to FN are connected to the alarm bus AB which feeds one side of the alarm detection circuit ADC. The other side of the alarm detection circuit is connected to the outlet of one of the buses (fuse FN in Fig. 1). The one side of the alarm detection circuit ADC is also connected to resistor RA which provides a source of idle state current which is polarised by diode DA. The alarm detection circuit includes an optical isolator OI which is (or is made by diode DA) a unidirectional device. The alarm detection circuit includes an arrangement activated by the light emitting diode Z of the optical isolator OI. Under non-fuse blown conditions, idle state current flows in the circuit formed by supply bus-bar SBB, fuse FN, the alarm detection circuit diode DA and resistor RA to earth. When any one of the fuses F1 to FN is activated (blows) the alarm bus AB is connected to the supply bus-bar SBB and the idle state current will be interrupted. The diode Z in the optical isolator OI will therefore switch off and this condition is used in the alarm detection circuit to activate an alarm condition.

It will be realised that the arrangement shown in Fig. 1 does not require a separate fuse to supply the fuse alarm system and that it can be connected across any load RL1 to RLN thereby allowing all fuses of an assembly to be usefully employed. Further the use of an idle state current under normal conditions allows the alarm to be activated when any fuse in the multi-fuse assembly fails or the main supply to the fuse assembly fails. Also faults in the alarm bus system wiring will cause interruption of the idle stat current and can therefore be detected.

Referring now to Fig. 2, a variant of the basic alarm system of Fig. 1 is shown. This involves the use of several diodes D1 to DN in an "OR" gate arrangement to provide the source of idle state current for the alarm detection circuit. The

advantage over th system of Fig. 1 is that the alarm indication will be removed as soon as the faulty fuse is remov d from the fuse assembly. In Fig. 1 the alarm indication will not be removed if FN happens to be the blown fuse and is removed for replacement. In the arrangement of Fig. 2, not all of the diodes D1 to DN require to be provided in general only two would be sufficient for most circumstances.

It will be realised that polarities and voltages shown in the drawing are illustrative only and can be varied depending upon particular application.

CLAIMS

1. A fuse alarm system comprising a plurality of alarm type fuses arranged in a multi-fuse assembly having their alarm bars connected to a common alarm bus which feeds an alarm detection circuit, the common alarm bus being driven under non-alarm conditions by an idle state current which is interrupted by the activation of a fuse and the alarm detection circuit is arranged to detect the absence of the idle state current to activate an alarm condition.

2. A fuse alarm system comprising a plurality of alarm type fuses arranged in a multi-fuse assembly having their alarm bars connected to a common alarm bus which is connected to one input of a two input unidirectional alarm detection circuit and to an idle state current defining resistor whereas the other input of the alarm detection circuit is connected to one of the fuse outlets, the unidirectional alarm detection circuit being connected in such polarity manner that an idle state current flows through the alarm device when all the fuses of the assembly are intact, which current is interrupted when any fuse blows.

3. A fuse alarm system according to claim 1 or 2 in which the alarm detection circuit includes an optical isolator device arranged to detect the presence of the idle state current.

4. A fuse alarm system according to claim 2 or 3 in which the other input of the alarm detection circuit is connected to a plurality of fuse outlets and each such connection includes a diode arranged so that an OR gate is formed to provide the source of idle state current for the alarm detection circuit.

5. A fuse alarm system substantially as described with reference to Fig. 1 of the drawing.

6. A fuse alarm system substantially as described with reference to Fig. 2 of the drawing.

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